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is inaccessible to many students because of its size and cost. Still more useful is the author's summary of the researches of De Geer, Brögger and their Scandinavian coworkers whose papers are inaccessible to most students. Perhaps the most interesting citation is the account of De Geer's study of the laminated lake clays by which he estimates the distance of annual glacial retreat at various points and arrives at an estimate of 9,000 years since the ice left Stockholm.

The loess appeals strongly to the author's interest and he finds the evidence overwhelmingly pointing to eolian origin. He tentatively regards the loess as a dry climate product. The chapter on raised beaches is splendidly illustrated and contains descriptions of features which the author has evidently studied at first hand. Of the various explanations of sea level offered he favors the depression of land by the weight of the ice and the abstraction of sea water by freezing into glaciers and the subsequent return of the water by the melting of the ice. The principal theories to account for the Glacial Period are given in outline, but the author holds that practically all are untenable. The final chapters summarize the researches of Scandinavian geologists which tend to show a post-glacial mildness of climate followed by more severe conditions which perhaps still persist.

The literature of glacial geology is so vast that a book which summarizes investigation is welcome; moreover, the book contains many observations and studies by the author himself. The student will miss a more inclusive bibliography by which the source of all the references and drawings could be ascertained.

F. V. EMERSON.

Igneous Rocks and Their Origin. By R. A. Daly. 563 pp. Maps, ills., index. McGraw-Hill Book Co., New York, 1914. 9 x 6½.

When Bacon wrote that "Books must follow sciences, and not sciences books," which is another way of saying that nothing fresh ever gets into a book, he gave to most scientific writers an excuse, that they have not been slow to avail themselves of, for writing dull books; and not even John Tyndall's brilliant suggestions as to the "Scientific Use of the Imagination" have borne much fruit. In Professor Daly's book, however, we have something that would surprise Bacon, delight Tyndall, and appeal to the ancient Greek philosopher as eminently fit and proper, for he has even had the temerity to go to facts, to nature, if you please, for the verification of his theories, rather than for the suggestion of theory. His brilliantly speculative papers, that have been appearing for nearly a score of years, have prepared a hearty welcome for this book; that geologists, and especially teachers of the science, have awaited with keenest interest, feeling sure that he who reads with Dr. Daly can never run in a rut.

The author tells us that his "book is intended to summarize and correlate the facts known about igneous rocks, with special reference to their field relations," and he has performed well this task.

The work is divided into three parts. The first of these "considers the facts which need explanation in a philosophy of the igneous rocks;" the second gives the general theoretical conclusions reached as to the origin and mode of irruption and eruption of igneous rocks, what the author modestly calls an eclectic theory; and the third outlines the results obtained by the author in applying his general theory to the known facts.

In the second chapter of Part I the author discusses the classification of igneous rock species, rejecting the so-called quantitative system, "as being based on assumptions concerning chemical relations in magmas, as having little adjustability to newly discovered facts, and as disregarding in its grouping significant relationships and conspicuous differences among the igneous rocks." He adopts a slightly modified form of the Rosenbusch classification, that working geologists have found so satisfactory for more than a quarter of a century, giving it a quantitative character in a table showing the average chemical composition calculated for each rock type. The ten groups of his table, the author designates clans; as the "granite clan," the "gabbro clan," etc.; and the consideration of these clans in detail he defers to Part III of the book.

Next follows the classification of intruded bodies into A, injected masses,

and B, subjacent masses. Under A are included I, concordant injections (injected along bedding planes), as intrusive sheets, laccoliths, and phacoliths; and II, discordant, or cross-cutting injections, as dikes, necks, bysmaliths, chonoliths, etc. Under B are placed stocks and bosses and batholiths. Extrusive bodies are similarly classified as to form.

Part II considers the cosmical aspects of the earth, and discusses abyssal injection, magmatic stoping, magmatic assimilation, magmatic differentiation, and the mechanism of volcanic vents, closing with a summary of the author's eclectic theory.

The rocks passed in review in Part III are discussed in the light of this theory.

COLLIER COBB.

Syllabus of Historical Geology. Columbia University, Department of Geology. By A. W. Grabau. 51 pp. A. G. Seiler, New York, 1912. 50 cents. 8 x 5½.

The division of historical geology into its three aspects of stratigraphy, paleontology and physiography forms the basis of the studies. Although the syllabus bears no reference to the relation between the first and last subjects; the order of succession may be taken to imply due recognition of interdependence. The course appears laid out according to established methods of ascribing paramount importance to paleontologic evidence as contrasted with the lithologic. While this is still natural in view of the mass of detail accumulated in the field of paleontology, the petrographic phases of historical geology should not be overlooked any longer. The terminology used is restricted to the more precise meanings evolved by modern demand for accuracy.

LEON DOMINIAN.

Physical Geography. By Philip Lake. xx and 324 pp. Map, ills., index. University Press, Cambridge, 1915. G. P. Putnam's Sons, New York. 9 x 6.

Intended for students who have had a course of general elementary science. It is assumed that the student understands the principles of the barometer and thermometer, and has some knowledge of the motions of the earth and the moon. The atmosphere, hydrosphere, and lithosphere are considered. Geological subjects not taken up in many physical geographies are included. Where the origin of a physiographic feature has not definitely been agreed upon by authorities the most important theories are given and discussed. In this connection the chapter on coral reefs and islands is of interest.

A feature of the work is the numerous sections, diagrams, etc., bearing on the text. Sections, especially if simple and well-drawn, always give the reader a clearer understanding of many problems in physiography and geology than any other method of visual instruction.

WILBUR GREELEY BURROUGHS.

Structural Geology. By C. K. Leith. viii and 169 pp. Ills., index. H. Holt & Co., New York, 1913. \$1.50. 9 x 6.

"The structural geologist," writes Leith, "has in recent years found it necessary in his field work to give much attention to the genetic relationship of rock structures produced by deformation. The student reads in general textbooks about individual structures, but seldom of their relations, with the result that at least in his early field work he may fail to utilize methods which are helpful or essential in the interpretation of the geology of a district. Emphasis upon geological structures as related parts of a record or process rather than as isolated facts determines the method of presentation in this book." He says that he was associated with Van Hise in the development of Van Hise's "Principles of North American Pre-Cambrian Geology," and that the book under consideration is partly a development and revision of the ideas of Van Hise's paper.

Among the subjects taken up are rock flowage, fractures, faults, structures common to both fracture and flow, types of mountains, major units of structure, ultimate forces of secondary deformation, isostasy being taken up in some detail, and unconformity.